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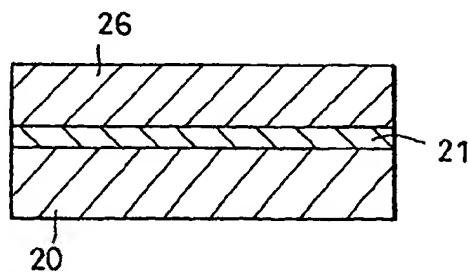
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(54) **Carbon nanotube device, manufacturing method of carbon nanotube device, and electron emitting device**

(57) The present invention discloses a carbon nanotube device comprising a support having a conductive surface and one or more carbon nanotubes, one of whose terminus binds to the conductive surface so that conduction between the surface and the carbon nanotube is maintained, wherein a root of the carbon nano-

tube where the carbon nanotube binds to the conductive surface is surrounded by a wall. Such a carbon nanotube device, having carbon nanotubes with a uniform direction of growth, can generate a large quantity of emitted electrons when it is used as an electron emission device.

FIG. 8A



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FIG. 8B

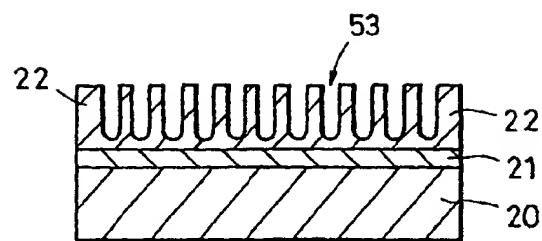


FIG. 8C

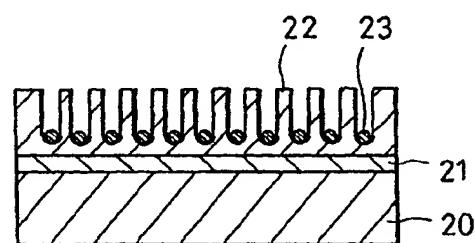
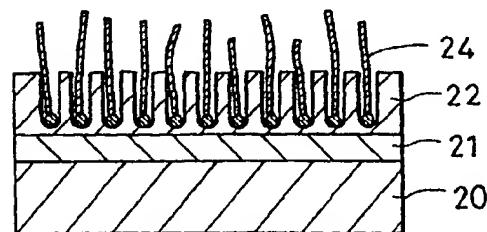


FIG. 8D





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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 8872

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
A	T. KYOTANI ET AL.: "Preparation of Ultrafine Carbon Tubes in Nanochannels of an Anodic Aluminum Oxide Film" CHEM. MATER., vol. 8, 1996, pages 2109-2113, XP000626894 * page 2109, right-hand column, line 1 - page 2113, right-hand column, line 34 *	1	D01F9/127 G01B7/34						
A	EP 0 758 028 A (RESEARCH DEVELOPMENT CORPORATION OF JAPAN) 12 February 1997 * page 3, line 14 - page 4, line 49; claims; figure 1 *	1							
A	WO 90 07023 A (HYPERION CATALYSIS INT.) 28 June 1990 * page 2, line 14 - page 3, line 19 * * page 4, line 31 - page 8, line 6; claims *	1							
P, A	WO 98 05920 A (WILLIAM MARSH RICE UNIVERSITY) 12 February 1998 * page 8, line 4 - page 9, line 25; figure 1D *	1	<table border="1"> <tr> <td>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</td> </tr> <tr> <td>D01F G01B C01B</td> </tr> </table>	TECHNICAL FIELDS SEARCHED (Int.Cl.6)	D01F G01B C01B				
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D01F G01B C01B									
<p>The present search report has been drawn up for all claims</p> <table border="1"> <tr> <td>Place of search</td> <td>Date of completion of the search</td> <td>Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>19 February 1999</td> <td>Hellemans, W</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	19 February 1999	Hellemans, W
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19-02-1999

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 758028	A	12-02-1997	JP	9031757 A	04-02-1997
			JP	9228160 A	02-09-1997
			US	5863601 A	26-01-1999
WO 9007023	A	28-06-1990	AU	642401 B	21-10-1993
			AU	4947390 A	10-07-1990
			CA	2005642 A	16-06-1990
			EP	0451208 A	16-10-1991
			IL	92717 A	27-02-1994
			JP	4504445 T	06-08-1992
			KR	137224 B	28-04-1998
			US	5500200 A	19-03-1996
WO 9805920	A	12-02-1998	AU	4055297 A	25-02-1998